EXHIBIT 2

to

PLAINTIFFS' MOTION FOR PRELIMINARY INJUNCTION

in

Western Watersheds Project and Center for Biological Diversity v. U.S. Department of the Interior, et al.

Case No. 2:23-cv-435-CDS-DJA

Declaration of Dave Stricklan, Ph.D.

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UNITED STATES DISTRICT COURT

DISTRICT OF NEVADA

WESTERN WATERSHEDS PROJECT and the CENTER FOR BIOLOGICAL DIVERSITY, Plaintiffs, vs. U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, JARED BYBEE in his official capacity as Field Manager of the Bureau of Land Management Bristlecone Field Office, and SHIRLEY JOHNSON in her official capacity as Field Manager of the Bureau of Land Management Caliente Field office, Defendants.	Case No: 2:23-cv-435-CDS-DJA **DECLARATION OF DAVE STRICKLAN, PH.D.**

I, Dave Stricklan, declare under penalty of perjury as follows:

1. I have personal knowledge of each of the facts set forth below, and if called upon to do so, could and would testify regarding the following.

2. This declaration is submitted in support of Plaintiffs' Motion for Preliminary Injunction in the above-captioned matter.

3. In preparing this declaration, I have relied on the body of research relating to pinyon pine, juniper, and sagebrush ecology with which I am familiar, and my personal knowledge and experience in pinyon pine, juniper, and sagebrush habitats.

Background, Experience, and Qualifications

4. I hold joint appointments as a sagebrush specialist for the Sagebrush Habitat Conservation Fund and Western Watersheds Project. Both are non-profit groups that work to protect and restore sagebrush habitat in the American West to benefit native wildlife. I have served in these positions since July 2020. I work with private landholders and federal land management agencies to protect sagebrush landscapes.

5. I hold a Ph.D. in Range Science from New Mexico State University, Las Cruces. I also hold M.S. and B.S. degrees in Range and Wildlife Science from Brigham Young University in Provo, Utah. My Ph.D. research focused on the role of seed dispersal of one-seed juniper (*Juniperus monosperma*) by juniper cone eating animals. (Junipers are conifers and their modified fleshy cones are commonly called juniper “berries”). My full CV is attached for reference.

6. I was a Visiting Assistant Professor at New Mexico State University and taught range science courses there in 2019 and 2020. Before that, I was a member of the faculty at Brigham Young University-Idaho in Rexburg, Idaho, where I taught courses in wildlife science, range science, and stream ecology for 14 years, from 2000 to 2014.

7. Prior to teaching range and wildlife courses at the university level, I worked as a wildlife biologist and range conservationist for the USDA Forest Service from 1988 to 1999, primarily in Utah and Idaho. My duty stations with the Forest Service were located in the sagebrush steppe landscape.

8. I have published peer-reviewed papers in scientific journals about juniper sapling survival (Estell et al. 2018), juniper seed germination rates (Stricklan et al. 2020), and dispersal patterns of juniper seeds contained in mammal and bird scats and pellets (Stricklan et al. 2022). I have also coauthored papers dealing with the roosting affinities of Townsend’s big-eared bats (Sherwin et al. 2000) and permanently marking bats (Sherwin et al. 2002).

9. I have extensive field experience, beginning in 1993 and continuing through the present, with monitoring greater sage-grouse populations by lek counts, fitting the birds with radio transmitters (and thereby monitoring their movements and survival), and with nest success evaluation. I conducted this monitoring in the sagebrush steppe of Strawberry Valley, Utah; the Little Lost and Birch Creek Valleys of Idaho; and the Arco Big Desert of Idaho.

10. I am closely familiar with research and scientific literature concerning the ecology and functionality of pinyon pine, juniper, and sagebrush landscapes.

11. I have reviewed the South Spring Valley and Hamlin Valley Watersheds Restoration Plan Environmental Assessment prepared by the BLM Ely District.

Scope of Testimony

12. This declaration describes irreparable environmental harm and long-term degradation of sagebrush and pinyon-juniper landscapes that will result from chaining and other vegetation-removal treatments proposed by the Ely District of the Bureau of Land Management (BLM) in the South Spring Valley and Hamlin Valley Watersheds Restoration Plan Environmental Assessment. I also recommend alternative restoration methods that would better accomplish BLM's purported ecological restoration goals.

Overview of Rangeland Health in the Project Area

13. The rangeland health of South Spring and Hamlin Valleys is summarized in Table 1.1 (page 5) of the EA. Most vegetative types in the project area are not currently meeting the BLM standards for understory cover and have not done so for some time. In most vegetative types, annual invasive plants (primarily cheatgrass (*Bromus tectorum*)) are present and increasing. The majority of riparian areas in the project area are either nonfunctional or functioning-at-risk. Streams have been rendered nonfunctional due to excessive bank trampling by domestic cattle and other herbivores, and from removal of soil-holding willows and other riparian woody species by domestic cattle and in some cases elk. (Cattle and elk populations appear to overlap in some areas because of heavy cattle use on the landscape.) When willows are no longer present to hold streambanks together, the banks erode and fail.

14. Cheatgrass—a highly invasive, non-native annual grass—has invaded much of the rangeland landscape in the project area. Vectors of cheatgrass and other non-native weed species are cattle and human activities. Many human activities in the project area are centered around support of livestock grazing and include water development, pipeline construction, and maintenance. Livestock water developments themselves are concentration areas for cattle, which result in heavy trampling impacts that create patches of bare ground; cheatgrass, also brought in by cattle, then establishes itself in those bare ground patches. Livestock and vehicles are the primary vectors of invasive plants into the semi-arid landscapes in the project area.

15. Livestock use (Van Auken 2009) and fire suppression (with the primary focus of preventing the loss of potential livestock forage) have allowed pinyon-juniper woodlands to recolonize some sagebrush sites in the project area.

16. Since 1946 BLM has prioritized livestock grazing in the project area. Before that, the General Land Office and the U.S. Grazing Service did the same. Previous decades of overuse and mismanagement have led directly to the current undesirable land-health conditions noted in Table 1.1 of the EA. The EA (page 24) briefly acknowledges, with citations, that historic and continued domestic livestock use is a primary causal factor of the nonfunctional rangeland health conditions west-wide, but then dismisses the alternative of reducing grazing without rebuttal, justification, or rationale. The proposed alternative then facilitates risky, ground disturbing methodologies with a track record of failure.

General Effects of the Proposed Mechanical Treatments

17. The South Spring Valley and Hamlin Valley Watershed Restoration EA proposes "restoring" the rangeland health of the project area by using the same on-the-ground methods that BLM has used for nearly nine decades—namely chaining, mowing, dixie harrow, roller chopper, prescribed fire, and livestock water developments—in a naïve and ultimately flawed attempt to arrest the slide into widespread nonfunctional rangeland health conditions that is being caused by the agency's own land management practices. In similar habitat in Colorado where pinyon pine and juniper were removed to "improve" the range, mechanically treated plots had 10 times higher

cheatgrass cover than untreated control plots (Johnston & Anderson 2023). BLM did not consider altering livestock numbers or use patterns—an obvious way to improve watershed health as, by BLM's own admission, livestock use has contributed to the current nonfunctional conditions. *See* EA at 5, 24. The techniques BLM proposes to use have been tried before and have failed to reverse the long-term trend of deteriorating conditions in the project area and across the West. Therefore, it is unlikely that the proposed "restoration" methods will improve the rangeland health of the project area. Rather, as described below, these methods will irreparably harm the landscape by indiscriminately removing functional shrubland and woodland habitat and dramatically increasing the likelihood that the affected areas will be invaded by cheatgrass and permanently converted to a cheatgrass community.

18. BLM failed to consider alternative methods that do not disturb the soil and retain critical pinyon pine trees. Manual, non-mechanical methods are only a minor component of the Proposed Alternative, likely because they are much slower than mechanical methods like chaining. However it is important to consider that the juniper recolonization of the landscape has been a many-decades-long process. Treatment of those acres is not a "hair on fire" emergency and manual methods could easily be implemented on a timeframe similar to that of pinyon pine/juniper recolonization. Manual removal methods have the added benefit of not facilitating invasion of the watersheds by cheatgrass and thus not increasing fire frequency.

Proposed Treatment Methods

19. The South Spring Valley and Hamlin Valley Watershed Restoration EA and selected alternative propose and authorize several different mechanical, prescribed fire, and hand treatment methods, and specify that any treatment, or combination of treatments, could take place in any area. Some of the proposed treatments include chaining, dixie harrow, roller chopper, mowing, mastication, hand treatment, prescribed fire, and chemical treatment. These methods are described below.

20. The <u>Chaining Method</u> involves dragging an anchor chain from a U.S. Navy vessel between two large bulldozers. The chain is made up of links weighing from 60 to 100-plus pounds.

Short sections of railroad rails or rebar are welded onto the links. The anchor chain and railroad rail links uproot and shred juniper trees and sagebrush plants. This method produces large areas of bare ground around uprooted juniper and sagebrush plants. The railroad rails further dig into the ground and denude the vegetation, leaving fresh gouges and piles of bare soil. Finally, the caterpillar, cleated-steel tracks on the dozers leave a two-track of exposed soil. The bare ground that results from chaining provides a soil surface devoid of competing plants and facilitates the establishment of cheatgrass stands that serve as seed reservoirs to infest the entire denuded landscape.

21. The <u>Dixie Harrow</u> is a heavy metal frame set with teeth (tines) that is dragged across the landscape. The teeth rip out shrubs, leaving gouges and piles of bare soil which are easily colonized by invasive plants, especially cheatgrass.

22. A <u>Roller Chopper</u> is a large steel cylindrical drum, equipped with 12-14 inch long steel blades along the cylinder. The cylinder is pulled behind a smaller dozer. The roller chopper shreds and chops sagebrush and other vegetation, thereby exposing bare soil. The tracks of the dozer can also expose bare soil. The exposed soil provides a seedbed for the establishment of invasive weeds, notably cheatgrass.

23. <u>Mowing</u> sagebrush and other vegetation is accomplished by pulling a mowing deck behind a tractor or small dozer. According to the BLM, the height of woody vegetation (primarily sagebrush) after the mower has passed over is from 12 to 15 inches. Sagebrush mortality rates range from 40 to 100 percent. Bare soil can be exposed by the tractor or dozer pulling the mower, but the mowing blade generally does not contact the ground, so less soil is exposed by this method of killing sagebrush.

24. <u>Mastication</u> is the cutting, chopping, or chipping of pinyon pine and juniper using logging equipment. Track and tire movement can leave bare soil but less so than some of the other methods of killing pinyon and juniper, particularly chaining and the dixie harrow.

25. Hand treatment is accomplished by using a chainsaw to clearcut or selectively cut pinyon pine or juniper. Relatively little ground is disturbed during this process, unless it is accompanied by pile burning or broadcast burning.

26. Prescribed fires are intentionally ignited fires used to remove pinyon pine, juniper, and sagebrush vegetation. Planned and emergency fire breaks are established by hand crews and dozers and/or tractors, often leaving expansive areas of disturbed soil. The vegetative cover over expansive areas can be removed and the area rendered vulnerable weed invasion, particularly if cheatgrass is already present, as it is in South Spring and Hamlin Valleys.

27. Chemical treatment of pinyon pine, juniper, and sagebrush involves the use of herbicides to kill trees, shrubs, and herbaceous species. A number of herbicides are allowed in the 2007 Programmatic Environmental Impact Statement for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States. Ground application by mechanized equipment can sometimes lead to newly exposed soil from ground vehicles.

Mechanical Treatments Such as Chaining Cause Irreparable Harm by Promoting Cheatgrass Invasion and Increasing Fire Danger

28. Much of the vegetative understory cover layer in the South Spring and Hamlin Valleys is dominated by invasive plants, primarily cheatgrass (EA Table 1.1). Cheatgrass is an aggressive annual grass that is generally introduced into an area by livestock and by human activity along roads. Cheatgrass seeds are then rapidly distributed across microsites with disturbed soil surfaces by the wind. Cheatgrass aggressively colonizes areas where the soil has been disturbed. Because cheatgrass is an annual plant, it concentrates its growth in above-ground tissue (seeds) rather than in the roots. It quickly makes viable seeds which ripen earlier than the seeds of other plants. These seeds are broadly distributed by the wind and within a single year, cheatgrass can colonize and “take over” a site where the soil has been disturbed. Once this site conversion takes place, seeds from native plants, which mature later in the season, are outcompeted by cheatgrass and the site is then permanently converted from native vegetation useable by a variety of wildlife (and domestic livestock) to a monoculture of cheatgrass.

29. Conversion from any of the primary vegetative communities in the project area to cheatgrass will result in irreparable harm to wildlife of all kinds, including insects, other arthropods, small and large mammals, birds, and even livestock. Once a vegetative community has experienced a state change and transitioned to a cheatgrass site, it is virtually impossible to go back over the "state threshold" to the original vegetative community.

30. Cheatgrass seeds are attached to a long sharp appendage called an "awn" which lodges in any available space or in hair and fur and facilitates highly efficient transport of the seed. Cheatgrass seeds commonly pioneer distant sites by lodging in motorized machinery and vehicles or in the hair of livestock that are transported long distances. The next year the cheatgrass produces seeds which are then distributed by the wind. The annual seeds germinate aggressively on any available disturbed soils and "take over" a site.

31. Ironically, past "range improvement" projects that were intended to improve a rangeland site commonly disturbed the soil while distributing cheatgrass seeds and became the origin point for new invasion epicenters. Established, perennial plants with deeper roots and biological soil crusts can prevent establishment of cheatgrass. However, this project proposes the exact same protocols and methodologies that are responsible for past "project failures." The risk of facilitating some new invasion sites resulting from soil disturbance by machinery associated with this proposal is virtually guaranteed. The irreversible diminishment resultant from the conversion of a site with disturbed soil from native vegetation to cheatgrass profoundly overwhelms the limited, hoped-for range site improvement associated with mechanical treatments of the native sagebrush and pinyon-juniper vegetation. The track record of mechanized rangeland projects is poor and frankly indicates that BLM range managers are slow learners.

32. Because cheatgrass grows, makes seeds, and cures out early in the growing season, it is much more susceptible to fire ignition and carries a fire farther and faster than native vegetation. Once a fire has burned through a cheatgrass-dominated landscape, the soil is left bare and vulnerable to recolonization by windblown, early season germinating cheatgrass seeds, so the process repeats itself and cheatgrass is reestablished. The early, rapidly germinating and growing

cheatgrass seeds establish either where the fire has left the soil bare of other plants or, in the absence of fire, in the same unburned footprint where cheatgrass outcompeted native plants and seeds the year before.

33. The mechanical treatments proposed by BLM in the South Spring Valley and Hamlin Valley Watershed Restoration EA disturb the soil and necessarily leave bare soil patches that ensure invasion by cheatgrass. One of the primary causes of the "unsuccessful" past treatments referenced in the EA is invasion by cheatgrass after soil disturbance.

34. Ecological site conversion from native vegetation to an invasive plant community dominated by cheatgrass can be a *fait accompli* in a single growing season and is practicably irreversible. Therefore, the soil-disturbing mechanical vegetation removal methods proposed in the EA, including chaining, mowing, dixie harrow, roller-chopper, mastication, and prescribed fire meet the definition of "irreparable harm" because they will be immediate, greatly diminish the forage base of wildlife and livestock, eliminate tree and shrub cover for decades and, for all practical purposes, irreversibly alter the affected plant communities.

35. Once a pinyon pine, juniper, or sagebrush site has been invaded by cheatgrass, an ecological site change takes place. Cheatgrass then replaces shrub species and facilitates a shorter fire interval that creates a cheatgrass-occupancy feedback loop. Cheatgrass dries out very early in the growing season and provides a tinder-dry carpet of grass that fosters "flashy," fast-moving fires. The more frequent fires effectively remove sagebrush and/or pinyon pine, juniper, and other shrub cover while providing a favorable soil bed for more cheatgrass seeds that are blown in from across the landscape. This fire cycle is repeated at frequent intervals, which prevents the more slowly establishing shrub and tree species from regaining a foothold on the site. This sequence of events results in the transition of the site from a shrub community to a much less biodiverse and bio-productive annual grass community which is prone to frequent, unnaturally large wildfires.

36. As noted, livestock and vehicles (including heavy machinery involved in past pinyon pine, juniper and sagebrush removal projects) are the main vectors for cheatgrass invasion and shrubland site conversion. In the EA, BLM proposes using the same mechanical methods that

have resulted in "failed" treatments and nonfunctional conditions in the past due to post-treatment annual grass invasion.

37. There are safe and historically successful methods of removing juniper from sagebrush stands that entail far less soil disturbance and thus less risk of site conversion (see below). But except for single-tree hand treatments by a worker using a chainsaw and chemical treatments, these other methods were not evaluated in the EA.

38. The list of preferred pinyon pine, juniper, and sagebrush plant removal methods appear to have been selected by reviewing the history of "failed" juniper and sagebrush treatments since the 1950s and authorizing BLM managers to choose from among historically ineffective methods like chaining, mowing, and prescribed fire in the Preferred Alternative. It is inevitable that these ground disturbing treatments will result in "failed treatments" (cheatgrass invasion), just as they did in the 1950s, '60s, '70s, '80s, '90s, 2000s, and 2010s.

Irreparable Harm from Pinyon-Juniper Removal Treatments

39. The footprint of pinyon pine/juniper woodlands on the landscape expands and contracts over contemporary and geologic timescales in response to climactic and human-induced conditions (Stricklan et al. 2022). In many places in North America and worldwide, the juniper woodland footprint is currently expanding due to domestic livestock grazing, climate change, and reduced fire frequency (Van Auken 2009). Specific wildlife species (e.g. pinyon jay, juniper tit, bobcat, mountain lion, and golden-mantled ground squirrel) show negative responses to historically chained sites, indicating long-term adverse effects to wildlife habitat value from chaining (Gallo et al. 2016). Further, it is questionable whether the removal of pinyon and juniper trees benefits generalist species such as mule deer or sagebrush-obligate species such as sage-grouse, as BLM claims in the EA (Bombaci & Pejchar 2016).

40. Chaining to remove juniper trees necessarily requires the removal of pinyon pine trees as well. Because pinyon pine trees are so valuable for many wildlife species the pinyon pine/juniper tradeoff is a net negative and represents "old thinking" that does not recognize the importance of the most important wildlife food source in pinyon-juniper stands. The tradeoff is

rarely ecologically defensible. In a review of just such a tradeoff in Utah, researchers (Orlemann and Robison 2020) concluded: *"For managers, it is important to recognize that some proposed pinyon-juniper removal projects will remove primarily pinyon, not juniper. Whether such pinyon eradication is either necessary or desirable should be carefully considered by land managers."* This EA is silent on the issue and offers no thoughtful evaluation of retaining pinyon pines, which are the most important wildlife food source in the pinyon-juniper woodland.

41. Given the strong proclivity of cheatgrass to invade pinyon-juniper chaining and other mechanically treated sites (Johnston & Anderson 2023), and considering that mechanically treated pinyon and juniper woodland are at high risk of permanent site conversion to a cheatgrass-dominated, depauperate rangeland with little wildlife habitat value (Ostoja & Schupp 2009), I conclude that the proposed mechanical pinyon-juniper removal treatments, including chaining, will irreparably harm the affected areas and will not benefit native wildlife or restore natural ecological processes.

42. The conversion of a sagebrush site to a pinyon-juniper site is reversable over time but a conversion of a pinyon-juniper site to a cheatgrass site is not. Invasion by cheatgrass results in an ecological "state change" and is for all intents and purposes irreversible on a human-related time scale.

43. There is no "hair-on-fire" imperative to use large scale and massively soil-disturbing mechanical methods for two reasons: (1) the current extent of pinyon-juniper woodlands, though expanding, is still well within the historical range of pinyon-juniper woodlands in western North America; and (2) the recolonization of some rangeland sites by pinyon-juniper woodlands has been a decades-long phenomenon. Removal of pinyon pine and juniper plants without risking invasion by cheatgrass through soil disturbance sites is possible by manual or hand methods. The hand treatment chainsaw and (when there is snow cover) hand treatment propane torch method (not evaluated by the BLM) are in temporal scale with the observed expansion of pinyon-juniper woodlands over the past century. Hand methods are easily executed and provide the added benefit of likely being performed by local contractors or seasonal BLM employees, in

contrast with chaining or other mechanical methods which are often contracted out to out-of-area specialized equipment owners.

44. Pinyon pines provide energy-rich pinyon nuts which are an obligatory part of the diet of pinyon jays. Additionally, almost all vertebrate wildlife species common in pinyon-juniper woodlands exploit the pinyon pine nut food resource to some degree. A partial list of wildlife that use pinyon pine nuts includes, mule deer, chipmunks, wood rats, the entire suite of forest mice, Clark's nutcracker, and turkey. In the winter, porcupine survive by eating the cambium layer under the bark of live pinyon pine trees. They avoid juniper trees.

45. Because pinyon pine nuts are critically valuable to so many wildlife species and are integral to Native American cultural practices, any genuinely honest multiple-use strategy for removing recolonizing juniper on the landscape would retain pinyon pine trees on the landscape. By design, chaining and application of chemical herbicides are indiscriminate killers of all woody plant species. The dixie harrow, roller chopper and mowing methods indiscriminately kill sagebrush and smaller (young) pinyon pine and juniper when present. These indiscriminate woody species treatments would prevent retaining high value pinyon pine on the landscape. Hand methods could, if properly executed, retain pinyon pine trees on the landscape.

46. Bark dwelling and other bats that commonly forage and/or roost in pinyon-juniper woodlands (Chung-MacCoubrey 2005). Consideration was not given to their habitat needs in the wildlife analysis of the EA.

47. Among other species of bats, small-footed myotis, long-eared myotis, fringed myotis, long-legged myotis, and big brown bats are known to inhabit pinyon-juniper woodlands. Several of these species are known to roost beneath the bark of pinyon pine and/or juniper, especially long-legged myotis.

48. Bats are apex level carnivores. They feed on insects and are an important part of the dynamics of insect and pest dynamics in pinyon pine, juniper and bordering sagebrush habitats. Whenever apex predators in any system are removed, there is a trophic cascade of ecological impacts to other species and vegetative habitat with unintended (usually negative) impacts. The

impacts from the removal of necessary roosting habitat for bark-roosting bats is not yet well understood, but the ecological mechanism of damage to the ecosystem caused by the removal of apex predators is widely recognized in the scientific literature.

49. Any analysis of woodland removal impacts to wildlife associated with pinyon pine, juniper and sagebrush stands not including bats that roost under bark or hunt in pinyon-juniper woodlands or sagebrush stands is incomplete and increases the likelihood of irreparable harm to these species and their habitat from the proposed mechanical treatment methods.

Irreparable Harm from Sagebrush Reduction Treatments

50. The preferred sagebrush treatment methods identified in the EA are individually flawed, primarily because they disturb the soil and prepare a seedbed of bare ground that is readily colonized by wind-distributed cheatgrass seeds. Cheatgrass seeds are generally not competitive with established native vegetation because the existing established root systems outcompete the nascent root of single cheatgrass seeds. Cheatgrass establishes in bare-ground patches where there is little or no competition from other plants, which is exactly what the preferred alternative, Alternative A, will ensure. Once an area has been colonized by cheatgrass, it is vulnerable to a frequent fire cycle which burns the thick annual grass residual cover and prevents long-lived woody species such as sagebrush from becoming reestablished.

51. Cover of various subspecies of sagebrush has been greatly reduced since the BLM began managing public lands in the West. There is no sound ecological reason to remove additional sagebrush. Sagebrush has historically been removed in order to allow grass species, which are the preferred diet of domestic livestock, to occupy shrubland and woodland sites. BLM has planted millions of acres of non-native crested wheatgrass in place of sagebrush and pinyon-juniper stands, a practice that reduces habitat values and irreparably harms native wildlife. Given its purported emphasis on sage-grouse conservation, it is inconceivable that BLM seek to remove even one more acre of the imperiled sagebrush vegetative community.

52. Sagebrush stands are self-thinning over time, so there is no reason to roller-chop or mow them to reduce shrub canopy cover to allow understory grasses to increase. Some species of

sagebrush, particularly mountain sage, can reestablish after disturbance. When they do so, the initial replacement stands can be quite thick. However, over time the individual sagebrush plants will grow deeper and more complex root systems that begin to compete with one another. Some individual plants will outcompete neighbor individuals for water and nutrients. Some individuals will therefore die out and the stand self-thins, allowing the understory native bunchgrasses to increase cover.

53. Roller-chopping, mowing, and chaining are also not effective treatments to reduce juniper recolonization of sagebrush stands. Some small juniper seedlings are shorter than the mowing blade level or are flexible enough to bend flat to the ground when the roller chopper cylinder or chain rolls over them. The mechanical treatment simply reduces the sagebrush canopy, thereby reducing the competition from sagebrush to small juniper seedlings and saplings. At the same time, the various mechanical methods create bare soil patches which serve as seedbed nurseries for cheatgrass. Using these failed intrusive mechanical methods diminishes sagebrush stands while creating seedbeds devoid of plant competitors that facilitates cheatgrass invasion. In the South Spring Valley and Hamlin Valley Watershed Restoration EA, BLM essentially proposes killing the patient in order to remove the disease (again).

54. Pygmy rabbits (*Brachylagus idahoensis*) are tied to sagebrush habitats where soil conditions allow excavation of burrows (Green and Flinders, 1980). They were petitioned to be listed as an endangered or threatened species in 2007. The U.S. Fish & Wildlife Service did not list the species as threatened or endangered at that time, but because pygmy rabbit populations are tied to sagebrush habitats and are often small and found in isolated patches, they remain a species of conservation concern. The pygmy rabbit was petitioned for ESA listing again on March 6, 2023. The U.S. Fish and Wildlife Service has yet to make a determination on the 2023 listing petition.

55. Because pygmy rabbit populations are often isolated, they are vulnerable to extirpation. They rely on sagebrush for hiding and thermal cover and in winter as the primary component of their diet (Welch et al. 1984). Mowing sagebrush, mechanical ground disturbance to burrow sites, loss of sagebrush habitat due to prescribed burns and the risk of site conversion

from sagebrush to cheatgrass all expose individual, small or isolated pygmy rabbit populations to irreparable harm in the form of local population extirpation.

56. The obligatory link of sage-grouse to sagebrush is by now well known, and widely accepted. Application of soil-disturbing methods such as chaining, mowing, roller chopping, and dixie harrowing in the name of removing recolonizing pinyon-juniper woodlands from established sagebrush stands (which is a natural ecological process), or the removal of so-called "decadent" sagebrush (Smith and Beck 2018) will result in physical damage and removal of sagebrush from currently functional stands. This harm may be considered irreparable as sagebrush stands often take decades to fully recover, even in the absence of human disturbance and cheatgrass. Additionally, the proposed mechanical sagebrush removal treatments will expose sagebrush stands to the very real risk of permanent and irreparable transition to a cheatgrass site, rendering them permanently unusable to sage-grouse.

57. The notion of "decadent" sagebrush is outdated and is a relic of a bias where range managers emphasized mechanical methods to increase the grass understory by removing the sagebrush overstory (Yeo, 2014). So-called "decadence" in a sagebrush stand is just natural self-thinning that occurs as sagebrush plant root systems begin to compete with one another. As noted previously, the risk of cheatgrass invasion of mechanically treated sagebrush stands is high. Further, young juniper seedlings and saplings are flexible and bend over, often escaping the mechanical treatment. If a risk is taken to treat "decadent" sagebrush, research done by the BLM elsewhere (Yeo 2014) suggests three caveats: (1) The site should have 4-5 years of rest from livestock grazing; (2) After the 4-5 rest period, implement a conservative (i.e., reduced) stocking rate for a period of ten years; and (3) Do not treat sagebrush at all where there is a risk of cheatgrass invasion.

58. Managers should use "extreme caution" when treating existing sagebrush communities (in supposed support of sage-grouse) to avoid long-term declines in sage-grouse (Smith & Beck 2018). Continuing harm to and reduction of sagebrush habitats in the West is in part due to the dated and misguided false notion of "decadent sagebrush." Sagebrush stands self-

thin and then regenerate in a natural cycle over time. Using mechanical methods to supposedly speed up or enhance this natural process exposes natural sagebrush stands to invasion by cheatgrass and years long diminishment of current sage-grouse numbers on site. A modest reduction in domestic livestock stocking rates would result in an enhanced understory grass component without the risk of mechanical treatments.

Irreparable Harm from Destruction of Biocrusts and Soil Erosion

59. Biocrust communities are made up of complex assemblages of lichens, algae, cyanobacteria, mosses and bryophytes. They are particularly important in semiarid habitats because they hold soil moisture, protect the soil surface from erosion and invasion by weeds, contain carbon reserves, and even provide some winter forage for pronghorn (Thomas and Rosentreter 1992) and other animals. Biocrusts are particularly vulnerable to being crushed by ground disturbance from heavy machines. The ground-disturbing treatments proposed in the EA would decimate slow-growing biocrust communities, lead to further soil erosion and invasion by cheatgrass, and create inevitable irreparable harm because of permanent soil loss and site transformation to cheatgrass communities.

Non-Mechanical Methods Are More Likely to Accomplish BLM's Stated Restoration Goals

60. The recolonization of rangelands by juniper is not a new or unnatural ecological event. Rather, it is a dynamic process. The "frontline" of juniper recolonization generally moves downslope and into valley bottoms from upslope or rocky refuge areas much like a slow wave. Small mammals (primarily rabbits), mesocarnivores (coyotes and foxes), and occasionally birds distribute juniper seeds through their pellets and scats into bordering sagebrush or grassland habitats over time (Stricklan et al. 2022). This is a decades-long process and there is no emergency requiring immediate, indiscriminate "treatment," especially considering the documented risk of irreversible site conversion of sagebrush habitats to cheatgrass areas where mechanical activities have left bare soil patches.

61. Manual or hand removal of juniper can easily be instituted on a long-term programmatic basis. This would allow selective removal of juniper while leaving pinyon pine for wildlife. A strategy based primarily on hand removal would also prevent the inevitable invasion by cheatgrass of bare soil patches associated with mechanical methods, especially chaining. Cheatgrass invasion in the project area is the hallmark of decades of failed management by BLM.

62. Further, because Rocky Mountain juniper (*Juniperus monosperma*) is strongly dioecious (individual trees are either male or female, not both), hand removal methods could retain non-female cone (berry) bearing trees while removing berry producing trees, thus stopping further spread of Rocky Mountain juniper into sagebrush stands. Granted, this method would not be possible when Utah juniper (*Juniperus osteosperma*) occurs on the site as Utah juniper are monecious (house both male and female cones on the same tree).

63. Riparian areas, seeps, and springs are profoundly important to animals, wild and domestic, in semi-arid habitats. Streams and wet areas are disproportionately important habitats in the EA analysis area. The primary cause of damage leading to nonfunctionality of streams and wet areas is trampling by concentrated ungulates, both wild and domestic (Ripple et al. 2022). Restoration of streamsides is a naturally passive process. Once ungulates (domestic or wild) no longer trample and break off the banks and no longer strip away the willow and cottonwood vegetation whose roots hold streambanks in place, the streams immediately begin to heal and move towards properly functioning ecological function. Birds (including sage-grouse broods), insects, and mammals increase in diversity and density in these emerging, healthy stream banks.

64. The positive ecological return from stream rehabilitation to sage-grouse, tree roosting bats, and virtually all other native animal lifeforms in the semi-arid Great Basin would be immense and vastly outweigh the limited potential return, and likely irreparable harm, from the upland mechanical treatments proposed by BLM. The primary beneficiary of the proposed (and ecologically risky) methods are non-native privately-owned domestic livestock. This disproportionate emphasis on privately-owned assets (livestock) using public vegetative resources explains not only the selected treatment methods, but also the focus in the EA of piping water out

of streams and springs to livestock water troughs. The buried pipeline scar and inevitable dust piosphere (livestock-caused bare dirt area) around the livestock water troughs are additional disturbed areas susceptible to cheatgrass invasion.

65. If BLM were genuinely interested in ecological integrity and restoration of depleted and diminished public land resources, it would focus on passive restoration of streams and springs with the requisite reduction in the level of domestic livestock use. Instead, the focus of this project is on harmful, expensive mechanical treatments in the uplands, away from the streams. The inevitable result, as evidenced by past project "failures," will be invasion by cheatgrass, an irreversible state change from native vegetation to cheatgrass stands, and a subsequent increase in wildfire risk.

66. Because other removal methods are effective, easily employed, and overall much less damaging to the welfare of sage-grouse and other sagebrush obligate wildlife species, it is curious that the regressive programmatic plan outlined in the EA was selected by the BLM. It is a virtual certainty that many of these treatments will lead to the same failed results of decades of BLM mechanical projects, ensuring continued diminishment and irreparable harm to the proposed project areas.

Pursuant to 28 U.S.C. § 1746, I declare, under penalty of perjury, that the foregoing is true and correct.

Dated August 23, 2023

Respectfully submitted,

/s/ Dave Stricklan
Dave Stricklan, Ph.D.

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Yeo, J. 2014. Revitalization of a native Wyoming big sagebrush/bluebunch wheatgrass community in Central Idaho: A ten year summary. Bureau of Land Management Idaho Technical Bulletin 2014-01. 38 pp.

DAVE STRICKLAN

Education

Ph.D. (2019) New Mexico State University, Animal & Range Science Dept.
M.S. (1987) Brigham Young University, Botany & Range Science (Wildlife Emphasis)
B.S. (1984) Brigham Young University, Botany & Range Science (Range Emphasis)
A.A.S. (1981) Ricks College, General Studies

Professional Experience

Executive Director – Rewilding Idaho 2023.
Specialist, Sagebrush Steppe Habitat Conservation Fund. 2020 – present.
Specialist, Western Watersheds Project. 2020 – present.

Visiting Assistant Professor, Department of Animal and Range Sciences - New Mexico State University. 2019 - 2020.

Ph D student, Department of Animal and Range Sciences - New Mexico State University. 2014 to 2019.

Tenured Faculty and Director of Wildlife Museum - Brigham Young University-Idaho (formerly Ricks College), Department of Biology. 2000 to 2014.

Supervisory Natural Resource Assistant - Targhee National Forest, Dubois Ranger District. 1998 to 2000.

Range/Wildlife Staff - Uinta National Forest, Pleasant Grove Ranger District. 1992 to 1998.

Range/ Wildlife Staff - Targhee National Forest, Island Park Ranger District. October 1990 to October 1992.

Wildlife Biologist - Nebraska National Forest, Bessey Ranger District. March 1989 to October 1990.

Range Research Technician - Rocky Mountain Research Station. USDA Forest Service, Rapid City, SD. June 1988 – March 1989.

Research Technician, winter porcupine studies. Brigham Young University, Department of Botany and Range Science. 1986-1987.

Grizzly Bear Trapper (volunteer). Interagency Grizzly Bear Team. July 1983.

Teaching Experience

At NMSU:
- RGSC 460 Advanced Range Management (Department Capstone Class)
- RGSC 440 & Lab Rangeland Resource Ecology
- RGSC 402 Senior Seminar
- RGSC 325 Rangeland Restoration Ecology

- RGSC 302V Viewing the Wider World – Forestry and Society
- RGSC 294 Rangeland Resource Management

At Brigham Young University-Idaho:

- Bio 100 General Biology
- Bio 118 Field Biology
- Bio 199 Biology Career Orientation (ecology based)
- Bio 202 Natural Resource Management
- AS/Bio 225 Introduction to Range Management
- Bio 302 General Ecology
- Bio 351 Principles of Wildlife Management
- Bio 362 Stream Ecology
- Bio 379 Ecological and Wildlife Techniques
- Bio 401 Readings in Biology
- Bio/REC 423 Natural Resource Policy

At Brigham Young University in Provo:

- Federal Agency Policy and NEPA - Special Problems

At Utah Valley Community College in Orem, Utah (now Utah Valley University):

- General Biology Lab
- General Biology
- General Biology Lab Coordinator (15-17 sections/semester)

Forest Service Experience

While employed by the USDA Forest Service, I worked as a Range Conservationist and as a Wildlife Biologist and served as the Principal District Staff for the following program areas: Lands, Minerals, Range, Roads, Threatened & Endangered Species, Watershed and Wildlife. I also served on wildlife-related Regional FS Committees for Bighorn Sheep, Bats, TE&S species, & standing timber sale appeals.

I have written numerous NEPA documents (Categorical Exclusions, Environmental Assessments and Environmental Impact Statements), Biological Assessments, Biological Evaluations and have participated in development of Forest Planning Documents.

I have testified before County, State and Federal boards, committees, and legislative bodies including:

- The Nebraska State Game & Parks Commission (twice) – Prairie Grouse seasons and White-tailed deer populations
- Utah Regional Advisory Council – (six times, mostly on big game seasons) – also served as a Board Member.
- **U.S. Congressional Subcommittee on Interior, Environment and Related Agencies** – Appropriations Bill

Publications

Stricklan, D. A.F. Cibils, P. Saud, R.L. Steiner, M.M. McIntosh, A.C. Ganguli, D.S. Cram, and A.M. Faist. 2022. Forests. Dispersal patterns of one-seed juniper seeds contained in mammal scats and bird pellets. Forests 13, 1693. https://doi.org/10.3390/f13101693

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Beeny L. and **D. Stricklan**. 1999 (non-refereed). Shuffling through Winter. Wyoming Wildlife (March).

Sherwin, R.E., D.S. Rogers, and **D. Stricklan**. 1996. The Gating and Management of Logan Cave, Utah, a cooperative effort. Bat Research News 37, 4.

Stricklan, D., J.T. Flinders, and R.G. Cates. 1995. Factors Affecting Selection of Winter Food and Roosting Resources by Porcupines in Utah. Great Basin Naturalist 55, 29-36.

Papers and Posters Presented

Stricklan, D., A.F. Cibils, P. Saud, A.M. Faist, R.L. Steiner, D.S. Cram, K. Young. 2020 Germination of one-seed juniper – who put that seed there? New Mexico Section Meetings of the Society for Range Management, Las Cruces, NM.

Stricklan, D., A.F. Cibils, P. Saud, A.M. Faist, A.C. Ganguli, and R.L. Steiner. 2018. Dispersal of one-seed juniper (*Juniperus monosperma*) seeds by a diverse frugivore guild in New Mexico. Society of American Foresters National Convention, Portland, OR.

Almalki, Y**.**, A. Cibils, R. Estell, **D. Stricklan**, S. Utsumi, A. Fernald. 2018. Juniper sapling regrowth following targeted grazing treatments in relation to terpenoid concentration. International Society for Range Management Meetings, Minneapolis, MN.

Stricklan, D., A.F. Cibils, and A.C. Ganguli. Distribution of one-seed juniper by a diverse frugivore guild. 2017. New Mexico Section Meetings of the Society for Range Management, Las Cruces, NM.

Stricklan, D. and A.C. Ganguli. 2017 (poster). Encroachment Enablers: Who left that juniper seed there? New Mexico Native Plant Society Annual Conference. Taos, NM.

Stricklan, D., D.W. Bailey, J.B. Lamb, M.F. Millward, and J.C. Whiting. 2016. Approaches to Manage Cattle Use of Riparian Areas: An Example from southeastern Idaho. International Society for Range Management Meetings, Corpus Christi, TX**.**

Stricklan, D. and D.W. Bailey. 2016. Approaches to Manage Cattle in Riparian Areas. New Mexico Section Meetings of the Society for Range Management, Los Lunas, NM.

Stricklan, D., D.W. Bailey, J.B. Lamb, M.F. Millward, and J.C. Whiting. 2015 (poster). Approaches to reduce cattle use of riparian areas through herding and strategic placement of supplement. International Society for Range Management Meetings, Sacramento, CA.

Stricklan, D. and D.W. Bailey. 2015. Using herding and strategic placement of supplement to reduce cattle residence time in riparian areas. New Mexico Section Meetings of the Society for Range Management, Socorro, NM.

Irwin, D.A., T.A. Messmer, **D. Stricklan**, and W. Shields. 1998. Potential impacts of contemporary harvest management strategies on mule deer: a reexamination of the role of chemosensory bio-stimuli in reproduction. National Mule Deer Meetings, Sacramento, CA.

Maxfield, B., **D. Stricklan**, and H.D. Smith. 1998. Habitat Utilization and group size dynamics of mountain goats (*Oreamos americanus*) in Central Utah. Utah Wildlife Society Meetings, Cedar City.

Sherwin, R.E., D. Rogers, and **D. Stricklan**. 1996. The gating management of Logan Cave, Utah: A cooperative effort. 26th Annual North American Symposium on Bat Research, Bloomington, IL.

Sherwin, R.E., D. Rogers, and **D. Stricklan**. 1996. Surveys of gating success for Category 2 designated species of bats in Utah. Colorado Bat Society Meetings, Durango.

Sherwin, R.E., D. Rogers, and **D. Stricklan**. 1996. Macrohabitat affinities of a damaged population of Corynorhynus townsendii in northern Utah. American Society of Mammalogy 76th Annual Meetings, Grand Forks, N.D.

Stricklan, D., and J.T. Flinders. 1989. Factors affecting dietary selection by porcupines in Utah. Society for Range Management International Meetings, Billings, MT.

Stricklan, D., and J.T. Flinders. 1988. Movements of porcupines in Central Utah. Utah State Wildlife Meetings, Provo.

Stricklan, D., and J.T. Flinders. 1986. Plant herbivore relationships between porcupines and gambel oak (preliminary results). Utah Academy of Science Spring Meetings, Cedar City.

Invited Seminars

- Healthy Public Lands Symposium 2022 – University of Utah (Salt Lake City)
- Online Teaching & Mentoring in a Range Science Context 2020 – Utah State University (Logan)
- Encroachment by One-seed Juniper into Grasslands in Central New Mexico: Who Put That Seed There? 2020 – Utah State University (Blanding)
- Distribution of One-seed Juniper by Frugivores 2019 - Lincoln NF Leadership Team
- Distribution of One-seed Juniper by Frugivores 2019 - Arizona State University
- Statewide Range & Wildlife Management Issues 2019 - Montana State University
- Riparian Properly Functioning Condition (PFC) 2018 - Range Staff Gila NF
- Idaho Fish & Game 2012 - Master Naturalist Ecology Series
- Idaho Fish & Game 2011 - Master Naturalist Ecology Series
- Brigham Young University 2010 - Gray Wolf Reintroduction Issues
- Idaho State University 2008 - Natural Resources and Federal Agency Policy
- Idaho State University 2007 - Natural Resources and Federal Agency Policy
- Greater Yellowstone Coalition Annual Meeting 2007 - Idaho Bear Corridor
- Brigham Young University 1997 - Federal Agency Grazing Policy
- Ricks College 1992 - Grizzly Bear Management in Idaho
- University of Nebraska 1991 - Extension Program, Grassland Birds

Appointed and Elected Positions

Science Advisor – CANA Foundation. 2022.

Board Member – Friends of Camas [National Refuge]. 2021 - present

Board Member – Society for Range Management, New Mexico Section. 2020

President - Friends of Camas [National Refuge]. 2013.

Board Member - Friends of Camas [National Refuge]. 2012.

President - Idaho Chapter of The Wildlife Society. 2009-2010.

Board of Member - Greater Yellowstone Coalition. Bozeman, MT, 2006-2008.

Utah Regional Wildlife Advisory Council (Gubernatorial Appointment). The council set season and limit regulations for the Utah Division of Wildlife Resources. 1998-1999 term.

Research Associate. Forest Service Research Intermountain Region Shrub Sciences Lab. Provo, Utah. 1997-2000.

Upper Snake River Sage Grouse Working Group. 1999.

Bighorn Sheep Regional Lead Biologist. Intermountain Region of the Forest Service. 1997-2000.

FS Region 4 Standing Appeal Review Team. 1997-1999.

Bat Regional Lead Biologist. Intermountain Region of the Forest Service. 1995-1997.

Greater Yellowstone Bald Eagle Working Group (Chair). 1992.

North American Lynx/ Fisher/ Wolverine Working Group. 1990-1992.
Nebraska Taking Wing/ Waterfowl Working Group. 1989-1990.

Membership in Professional Organizations (past and present)

The Wildlife Society
Society for Range Management
Society of American Foresters
Utah Academy of Sciences
Western States Bat Working Group
Friends of Camas National Refuge
Audubon Society (local and national)
Greater Yellowstone Coalition
Foundation for North American Wild Sheep

Awards

Joe D. Wallace **Outstanding Range Student** Scholarship New Mexico State University (2015) Las Cruces, New Mexico.

Poster session, Ph D category (2015) - **second place award**. Society for Range Management International Meetings, Sacramento, CA.

BYU-Idaho College of Agriculture and Life Sciences (2004 – 2005) **Outstanding Faculty** cash award.

Faculty Service Learning Award (2002 – 2003) – **University Meritorious Service-Learning Award,** Brigham Young University – Idaho.

Utah Foundation for North American Wild Sheep **Public Land Steward of the Year** (1997).

Threatened, endangered and Sensitive Species (1993) **Outstanding Biologist of the Year**, Intermountain Region (4) of the U.S.D.A. Forest Service.

U.S.D.A. Forest Service Certification of Merit/ Cash Awards:

1999 (Primary Staff Duties) - Traghee N.F.
1996 (PacifiCorp Hydro Project) - Uinta N.F.
1994 (Threatened & Endangered Species Work - Bat & Goshawk) - Uinta N.F.
1993 (Winter Range Habitat Project) - Uinta N.F.
1992 (Mentoring Targhee N.F. Biologists) - Targhee N.F.
1991 (Rescue of Snowmobilers) - Targhee N.F.
1990 (Waterfowl Project) - Nebraska N.F.

F. Bertrand Harris Outstanding Senior Award/ Scholarship (1983) - Brigham Young University: Department of Botany and Range Science.

Star Chapter Farmer (1976) - Future Farmers of America, Butte Co., ID Chapter.

Idaho State Farm Cooperative Business Competition Winner & Representative to National Meetings in Washington, D.C. 1976.

Funding

I have procured the grants from the following sources:

$ 9,400	Aggies in the Forest (NMSU) – Lotic surveys for USDA Gila National Forest
$ 5,000	Idaho Chapter of the Foundation for Wild Sheep – Domestic sheep GIS allotment map and summary
$ 1,500	USDA Targhee National Forest – Spotted frog study & survey
$ 20,200	USDA Targhee National Forest – Threatened and Endangered Species Survey and habitat mapping
$ 10,000	Idaho State Unclaimed Livestock Fund – Rangeland habitat assessment
$ 120,000	Utah Division of Oil Gas & Mining, BLM, FS, – Townsend big-eared bat and abandoned mine survey and bat gating materials
$ 1,100	TREC Inc. Yellow-billed Cuckoo surveys and habitat mapping

Projects

I have worked on a variety of range & wildlife projects. Some of the notable projects include:

Riparian Rehabilitation projects, numerous streams in South Dakota, Nebraska, Utah, Idaho and New Mexico.

Survey of mid-sized mammals in Guanacaste National Park, Belize for the Belizean Forest Department and the Belize Audubon Society.

Rocky Mountain bighorn state-wide GIS mapping project. Funded by the Foundation for North American Wild Sheep and the BLM & FS. Statewide mapping of domestic sheep allotments that conflict with free ranging sheep populations.

Yellow-billed cuckoo inventory. Surveys for BLM & FS to detect nest sites using a call/respond protocol. Four students in cooperation with TREC Inc.

Rocky Mountain bighorn sheep habitat restoration project. Cooperators - Unita N.F., Foundation for North American Wild Sheep.

Sage grouse recovery team. Cooperators - FS, US Fish & Wildlife Service, Utah Division of Wildlife Resources, Utah Mitigation, Reclamation and Conservation Commission and Brigham Young University.

Elk study. Set elk/ livestock forage use partitioning. Cooperators - Unita N.F. and Utah Division of Wildlife Resources.

Boreal owl study. Cooperators - Unita N.F., Brigham Young University.

Bat gates on abandoned mine shafts. Approximately 45 structures made of jailhouse steel cemented into the rock substrate to allow bats passage into closed mines. Cooperators- Unita and Wasatch-Cache National Forest and Utah Division of Oil, Gas, and Mining.

Moose habitat utilization and improvement. Targhee National Forest, and Idaho Fish & Game. Aspen/ Conifer Invasion projects.

Winter Range decadence study. Cooperators- FS Research, Uinta National Forest and Utah Division of Wildlife Resources.

Neotropical migrant, great gray owl and boreal owl surveys.

Use of lodge pole habitat in a timber removal area of the Targhee National Forest. Cooperators - Targhee National Forest and Interagency Grizzly Bear Team.

Goshawk/Timber Harvest relationships. Cooperators - Targhee National Forest, Idaho Fish & Game, and Idaho State University.

Trumpeter Swan habitat requirements and habitat improvement. Cooperators - Targhee National Forest and University of Michigan.

Prairie Chicken nesting success study. Cooperators - Nebraska Game & Fish, and Nebraska National Forest.

Creation of the 2,000-acre Lord Lake Wetland Complex. Cooperators- Nebraska National Forest, Nebraska Game & Fish, and Ducks Unlimited.

Missouri River Breaks Mitigation and Habitat Typing. Cooperators- FS Research, South Dakota Game, Fish & Parks, North Dakota Game & Fish, and the Army Corps of Engineers.

Radio telemetry study of grizzly bears. Cooperators - Member Agencies of the Interagency Grizzly Bear Study Team.

Black bear research. Cooperators - Utah Division of Wildlife Resources and BYU.

Porcupine research. M.S. research at BYU.

Riparian studies at New Mexico State University.

Related Interests

Paleobiology: I enjoy collecting fossils. My most important finds are the holotype specimens for ***Brodioptera stricklani***, the oldest known winged insect from western North America, and ***Bourbonnella jocelynae*,** the oldest ray finned fish from western North America. Both specimens are from the Manning Canyon Shale formation.

I am interested in corridor ecology and rewilding.

I am interested in riparian area restoration.